

Sustainable productive sanitation solutions in rural Burkina Faso

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Headline summary

Productive or ecological sanitation aims to achieve the safe and efficient reuse of nutrients, organic matter and water from sanitation waste streams. Technologies such as urine-diverting dry toilets (UDDTs) have a high potential to improve access to sanitation while enabling the cycling of nutrients and organic matter in excreta that can be used to maintain soil fertility, in line with productive sanitation principles. In Burkina Faso, UDDT technology has been used in more than 30 initiatives over the past 15 years, involving more than 13,500 households. Significant lessons can be drawn to strengthen the sustainability of such initiatives and reach the scale required in rural Burkina Faso and other countries where soil fertility and sanitation access are important development challenges.

The issue/barrier to water reuse that is addressed

Burkina Faso is predominantly rural (74 per cent), and 85 per cent of the population are involved in agricultural activities (Institut National de la Statistique et de la Démographie

2022). Rural open defecation has decreased from 86 per cent in the year 2000 to 46 per cent in the latest census from 2022, mainly through the construction and use of millions of pit latrines (idem). However, pit latrines have several drawbacks, including poor resource recovery potential. A major part of key nutrients is lost from leaching, denitrification and vaporization in unlined pits (Graham and Polizzotto 2013). In Burkina Faso, nitrate pollution of groundwater is an issue, and pit latrines are one of the main suspected sources (Rosillon *et al.* 2012). Pit latrines are also vulnerable to inundation during heavy rains, which brings the risk of collapsing pits, as well as faecal contamination from overflowing water. In addition, pit latrines are not designed for easy and safe emptying, which puts the household in a challenging situation once the latrine is full.

In contexts such as rural Burkina Faso, where subsistence farming is dominant and access to commercial fertilizers is challenging, neglecting the fertilizer content of human excreta when introducing sanitation is a missed



Urine applied as a liquid fertilizer to maize. Source: Linus Dagerskog.



Papaya fertilized with urine in a cooperative garden in Saaba, Burkina Faso. Source: Linus Dagerskog.

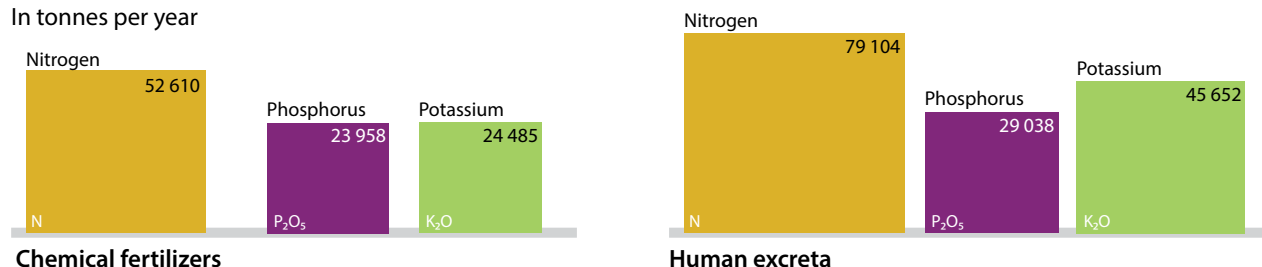
Table 1: Annual quantity of nutrients in human excreta in Burkina Faso with the corresponding quantity of urea and NPK (15:15:15) (the most common fertilizers in Burkina Faso).

	N (kg)	P (kg)	K (kg)
One person's excreta/year	3.8*	0.6*	~1.8**
<i>This quantity correspond to what is found in 14.4 kg of chemical fertilizers (9.2 kg of NPK (15:15:15) and 5.2 kg of urea):</i>			
9.2 kg of NPK (15:15:15)	1.4	0.6	1.2
5.2 kg of urea	2.4	–	–
Total	3.8	0.6	1.2
<i>For an average rural household of 5.6 people, this implies roughly 50 kg of NPK and 30 kg of urea:</i>			
Excreta from 5.6 people/year	21	3.3	10
50 kg of NPK (15:15:15) + 30 kg of urea	21	3.3	6.3

Notes: N and P are estimated based on the average daily protein intake in Burkina Faso according to the method proposed by Jönsson et al. (2004). Protein consumption data from FAOSTAT for the period 2015–2019 (Food and Agriculture Organisation of the United Nations [FAO] 2020). K is estimated based on the P/K relation of excreta in countries cited in Jönsson et al. (2004).

Application of plant nutrients from chemical fertilizers in 2020 compared with nutrients available in human excreta in Burkina Faso

In tonnes per year



Source: FAO 2020

Figure 1: Application of plant nutrients from chemical fertilizers compared with nutrients from human excreta.

opportunity. In effect, the annual quantity of nitrogen (N), phosphorous (P) and potassium (K) in the urine and faeces from the average rural family in Burkina Faso (household size = 5.6) is equivalent to the nutrients contained in 80 kilograms (kg) of commercial fertilizers (Table 1), which is more than many households can afford.

With prices varying between USD 25 and 50 per 50 kg bag of fertilizer in Burkina Faso (national prices for 2018-2022 from the Africa Fertilizer Initiative), the 80 kg fertilizer equivalent in urine and faeces corresponds to USD 40–80 a year per household. Extrapolated for the country of approximately 21 million inhabitants, available plant nutrients in excreta surpass what is currently used as chemical fertilizers in Burkina Faso (Figure 1) and have a fertilizer value of USD 150 million to USD 300 million.

To make productive use of this value, sanitation alternatives are needed, which enable resource recovery and reuse while also fulfilling other sustainability dimensions, such as health protection, acceptability, affordability and institutional appropriateness.

The response

In search of adequate solutions, the Water and Sanitation for Africa (formerly the Regional Centre for Potable Water and Sanitation) initiated a research and demonstration programme on productive sanitation, also known as ecological sanitation or “ecosan” in 2003. At this time, the focus was on UDDTs of the double vault type built off the ground and associated technical, social, hygienic and agronomic aspects. Based on the first pilot experiences, several larger projects were initiated, a couple of which



Tou Tagadi's family in Banfora show by their double vault UDDT. Source: Linus Dagerskog.

were even financed through agriculture/food security funds with grants based on the potential of “sanitation to improve production” (Dagerskog and Bonzi 2010). Over a period of 15 years, more than 13,500 households were involved in 30 productive sanitation projects, mainly piloted by different NGOs in Burkina Faso. Efforts to follow up on the outcomes several years post-project and draw lessons for the future initiatives are reported in Dickin *et al.* (2018) and Dagerskog *et al.* (2020) and are summarized here.

Results, accomplishments and outcomes

Three major projects were revisited two to six years post-project, with 70 to 89 per cent of toilets observed to be in use, depending on the project. Sustained outcomes were strongest in the projects, with the most emphasis on reuse, and in thorough training on the use of urine and sanitized faeces as fertilizers in Farmer Field Schools in partnership with agricultural organizations. The reuse potential was also cited by the households as the main motivation to acquire the toilet in this project. One of the currently more active NGOs in Burkina Faso (Association Koassanga) requires an interested household to attend the Farmer Field School on reuse during one agricultural season to strengthen reuse competence and increase motivation to use the toilets before they can apply for support to construct their own toilet.

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